Henry v. Rudolph Part 2

Audio and Hand Gesture Recognition

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Audio Recognition

- Real time stream segmentation

- MFCC feature extraction

- L1 distance with trained threshold

http://xa.yimg.com/kq/groups/24321415/1523383180/name/Speech_Recognition_seminar.pdf
http://neural.cs.nthu.edu.tw/jang/books/audiosignalprocessing/speechfeaturemfcc.asp?title=12-2%20mfcc

Pros / Cons / Improvements

- Pros
  - Fast classification and good initial results (compare to Sphinx or Google Voice API)
  - Simple implementation

- Cons
  - Sensitive to background noise
  - Requires training

- Improvements
  - Online learning to down-weight old recordings
  - Pitch invariance
  - Additional audio feature incorporation

Static Gesture Recognition

- Capture raw joint (x,y,z) coordinates and rotation information from 3Gears.

- Generate primitive features

- Decision tree classifier

http://www.threegear.com/technology.html
http://www.youtube.com/watch?v=NQDl5YTh8uQ

Continuous Gesture Recognition

- Implementation with HMM Left Right Model
- Can currently recognize 6 and 7 gesture
- Still needs additional tuning

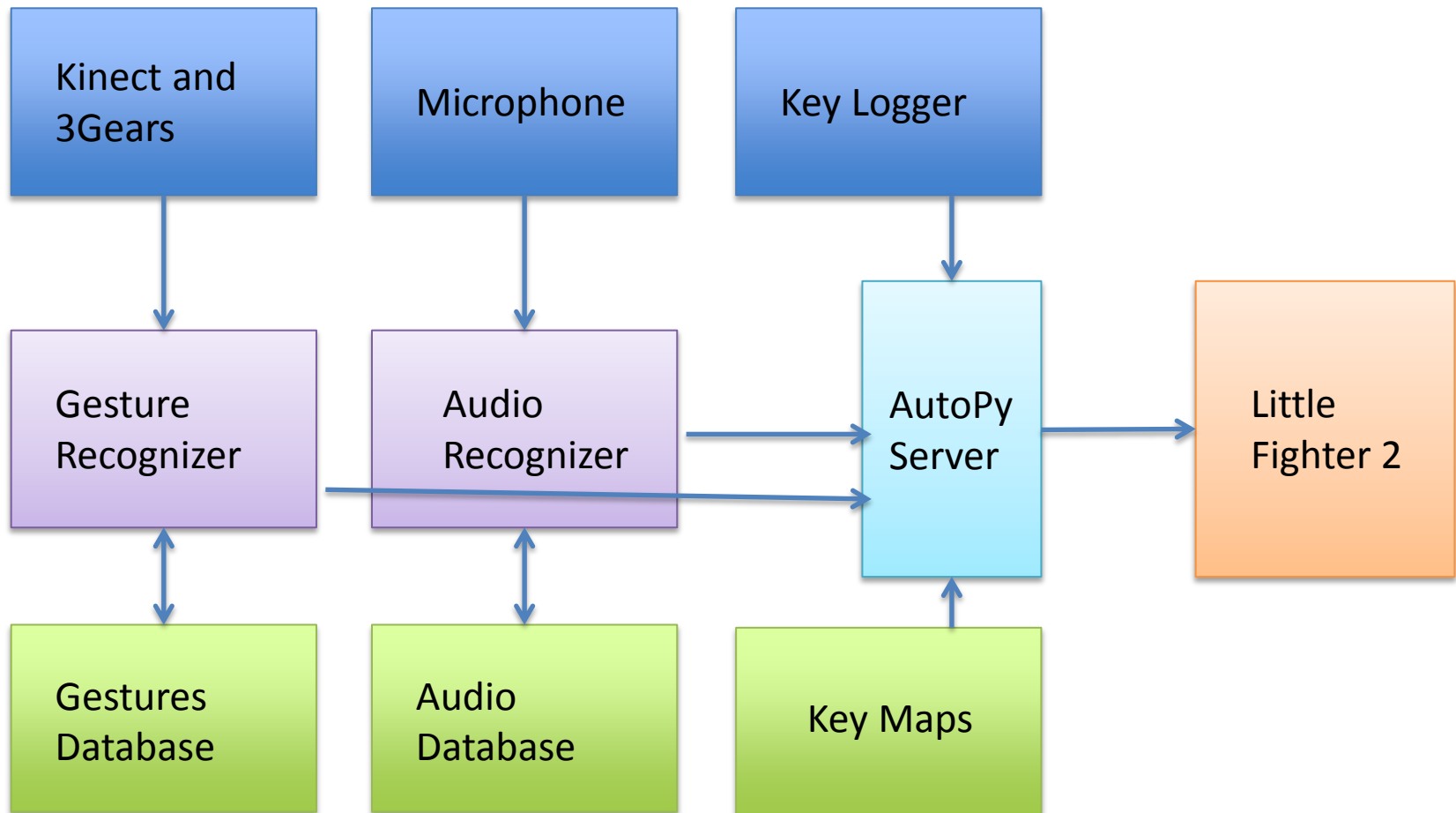http://herin.kaist.ac.kr/Publication/PS/hklee_PAMI_i09611.pdf

http://courses.media.mit.edu/2010fall/mas622j/ProblemSets/ps4/tutorial.pdf

http://zeroflag.web.elte.hu/gesture/CAMv31-68.pdf

http://www.creativedistraction.com/demos/gesture-recognition-kinect-with-hidden-markov-models-hmms/

Pros / Cons / Improvement

- Static gestures need little training but not as powerful as continuous system

- Continuous method requires very careful coding and implementation to get right

- Incorporate automatic parameter finding for continuous system

- More advanced graphical models do exist

Architecture Overview

Performance and Reliability

- Testing suite for audio and gestures
- Playing Little Fighter was much easier as beginners. Made the game more fun.
- Issues like false positives still exist

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Thanks for Listening!

Questions / Discussion